Notice of Allowability	Application No.	Applicant(s)	
	10/780,443	PESZYNSKI ET AL	
	Examiner	Art Unit	
	Jaworski Francis J.	3768	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *Interview 9/12/06*.
2. ☒ The allowed claim(s) is/are 1-20.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 3/6/06
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date (some)
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Francis J. Jaworski
Primary Examiner

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

An extension of time under 37 CFR 1.136(a) is required in order to make an examiner's amendment which places this application in condition for allowance. During a telephone conversation , W. Brinton Yorks requested an extension of time for ONE MONTH(S) and authorized the Director to charge Deposit Account No. 14-1270 the required fee of $120.00 for this extension and authorized the following examiner's amendment. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with W. Brinton Yorks, Reg. No. 28,923 on September 12, 2006.

The application has been amended as follows:

1. (currently amended) An ultrasonic surgical guidance imaging system which acts to guide the placement or observe the operation of an invasive medical device comprising:

an ultrasonic probe including an array transducer which steers ultrasonic beams over a volumetric surgical region (120) for image guidance of the placement or operation of an invasive medical device;

a detector responsive to the placement of an invasive medical device which acts to detect the location of the device in an image region;

a transmit beamformer coupled to the array transducer and responsive to the detected location of an invasive medical device which acts to control the array transducer to transmit a greater beam density in the sub-volumetric region in the vicinity of the location of the invasive medical device than the beam density in the volumetric region surrounding the sub-volumetric region;

a receive beamformer coupled to the array transducer and responsive to echo signals from array elements for the formation of beams of coherent echo signals;

an image processor responsive to the coherent echo signals for producing a three dimensional ultrasonic image of the volumetric surgical region and the sub-volumetric region in the vicinity of the invasive medical device; and

a display coupled to the image processor which displays the three dimensional ultrasonic image of the volumetric surgical region and the sub-volumetric region in the vicinity of the invasive medical device.

2. (previously presented) The ultrasonic surgical guidance imaging system of claim 1, wherein the transmitted beam density in a subvolumetric region in the vicinity of the invasive medical device is uniformly more dense than

the beam density of the volumetric region surrounding the subvolumetric region.

3. (previously presented) The ultrasonic surgical guidance imaging system of claim 2, wherein the transmitted density is relatively high in the subvolumetric region in the vicinity of the invasive medical device, and is relatively low in regions of the volumetric region surrounding the subvolumetric region.

4. (previously presented) The ultrasonic surgical guidance imaging system of claim 1, wherein the transmitted beam density is relatively high in the volumetric region in the vicinity of the invasive medical device, is relatively less at a given distance from the invasive medical device, and exhibits one or more intermediate densities at distances less than the given distance.

5. (previously presented) The ultrasonic surgical guidance imaging system of claim 4, wherein the transmitted beam density progressively declines with increasing distances or angles from the invasive medical device.

6. (previously presented) The ultrasonic surgical guidance imaging system of claim 5, wherein the transmitted beam density progressively declines with increasing distances from the invasive medical device until a threshold minimum beam density is attained.

7. (currently amended) A method of ultrasonically guiding the placement or observing the operation of an invasive medical device comprising:

transmitting ultrasonic beams over a volumetric region which includes the location of an invasive medical device in a sub-volume of the volumetric region;

detecting the location of the sub-volume;

controlling the beam density of the ultrasonic beams transmitted in the volumetric region in response to the detecting to be relatively high in the sub-volume in the vicinity of the invasive medical device, and to be relatively low at distances of the volumetric region removed from the ~~invasive medical device~~sub-volume;

receiving echo signals from the volumetric region and the sub-volume in response to the transmitted beams;

processing the received echoes to produce a three dimensional ultrasonic image of the volumetric region and the invasive medical device; and

displaying the three dimensional ultrasonic image of the volumetric surgical region and the sub-volume including the invasive medical device.

8. (previously presented) The method of claim 7, wherein controlling the beam density further comprises controlling the beam density of the ultrasonic beams transmitted in a subvolumetric region surrounding the invasive medical device to be uniformly high in relation to the beam density in the volumetric region surrounding the subvolumetric region.

9. (previously presented) The method of claim 7, wherein controlling the beam density further comprises controlling the beam density to decline to progressively lesser beam densities with increasing distances from the invasive medical device .

10. (previously presented) The method of claim 9, wherein controlling the beam density further comprises controlling the beam density to decline to a minimum beam density level at distances from the invasive medical device.

11. (currently amended) A method of ultrasonically guiding the placement or observing the operation of an invasive medical device comprising:

transmitting ultrasonic beams over a volumetric region which includes the location of an invasive medical device;

identifying the location of the invasive medical device in the volumetric region;

controlling the beam density of the ultrasonic beams transmitted in the volumetric region in response to the identification of the location to be relatively high in the vicinity of the identified location of the invasive medical device, and to be relatively low at distances of the volumetric region removed from the invasive medical device;

receiving echo signals from the volumetric region in response to the transmitted beams;

processing the received echoes to produce a three dimensional ultrasonic image of the volumetric region and the invasive medical device; and

displaying the three dimensional ultrasonic image of the volumetric surgical region and the invasive medical device.

12. (previously presented) The method of claim 11, wherein identifying the location of the invasive medical device comprises image processing ultrasonic echo data.

13. (previously presented) The method of claim 11, wherein identifying the location of the invasive medical device comprises receiving signals by the invasive medical device .

14. (previously presented) The method of claim 13, wherein identifying the location of the invasive medical device comprises receiving signals by the invasive medical

device in the acoustic, radio frequency, or electromagnetic spectrum.

15. (previously presented) The method of claim 11, wherein identifying the location of the invasive medical device comprises transmitting signals from the invasive medical device.

16. (previously presented) The method of claim 15, wherein identifying the location of the invasive medical device comprises transmitting signals from the invasive medical device in the acoustic, radio frequency, or electromagnetic spectrum.

17. (currently amended) An ultrasonic surgical guidance imaging system which acts to guide the placement or observe the operation of an invasive medical device comprising:

an ultrasonic probe including an array transducer which steers ultrasonic beams over a volumetric surgical region for image guidance of the placement or operation of an invasive medical device;

a transmit beamformer coupled to the array transducer which acts to control the spatial beam density of the beams transmitted by the array transducer in the volumetric region;

a detector responsive to echo signals from the array transducer which acts to detect the location of the invasive medical device in the volumetric region;

a multiline receive beamformer coupled to the array transducer and responsive to the detection of the location of the invasive medical device and to echo signals from array elements for the production of different orders of received multilines in the vicinity of the invasive medical device and in the volumetric region at locations removed from the invasive medical device location;

an image processor responsive to the received multilines for producing a three dimensional ultrasonic image of the volumetric surgical region and the invasive medical device; and

a display coupled to the image processor which displays the three dimensional ultrasonic image of the volumetric surgical region and the invasive medical device.

18. (previously presented) The ultrasonic surgical guidance imaging system of claim 17, wherein the multiline receive beamformer acts to produce a greater number of received multilines for each transmit beam in the vicinity of the invasive medical device than the number of received multilines for each transmit beam at locations removed from the invasive medical device location.

19. (previously presented) The ultrasonic surgical guidance imaging system of claim 17, wherein the multiline receive beamformer acts to produce a lesser number of received multilines for each transmit beam in the vicinity of the invasive medical device than the number of received multilines for each transmit beam at locations removed from the invasive medical device location.

20. (currently amended) The ultrasonic surgical guidance imaging system of claim 17, wherein the transmit beamformer is responsive to the detection of the location of the invasive medical device and acts to control the array transducer to transmit a different beam density in the volumetric region in the vicinity of the invasive medical device than the beam density in the volumetric region at locations removed from the invasive medical device location.

The following is an examiner's statement of reasons for allowance:

In addition to the citations of record, Wiesauer (US6688177) is directed to altering line density using multi-line or parallel processing beamformation however this is practiced as a function of e.g. regional motion and no system location of a medical instrument is involved.

Ustuner et al (US2005/0228280) is cited to complete the record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication should be directed to Jaworski Francis J. at telephone number 571-272-4738.

FJJ:fjj

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Francis J. Jaworski
Primary Examiner